Two Eels of the Genus *Pseudoxenomystax* from New Zealand Waters*

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Abstract

Pseudoxenomystax bulbiceps (Whitley, 1948), the type species of *Bassanago* Whitley and *Pseudoxenomystax hirsutus* n.sp., which has 306–314 dorsal, 204–222 anal, 15 pectoral rays and an elongate vomerine patch of teeth broader anteriorly, are both distinguished from other Pacific species of the genus in having the origin of the dorsal always over the branchial aperture. Adults have short, sometimes divided, more usually simple, epidermal processes which give a hairy appearance to the body. Similar eels from the South African region described under *Ariosoma* Swainson are also referable to *Pseudoxenomystax* Breder.

Introduction

Trawling in moderate depths of 150–350 fathoms by the M.V. *Alert* during the Chatham Islands 1954 Expedition produced eleven specimens of a small congrid eel not previously recorded from the New Zealand area. Subsequent work during 1957 in similar depths in the Bay of Plenty by the Department of Zoology, Victoria University of Wellington and the Dominion Museum and by the Department of Zoology in 600 fathoms in Cook Strait added three more specimens of the same eel. Mr. R. Baxter, a commercial fisherman undertaking experimental longlining for the Department in 1958–59, collected numerous specimens of a remarkably similar, but very much larger eel from traps set in about 430 fathoms near Oaro, Kaikoura. The two species represented by these collections are described in this account.

The congrid eels related to the genus *Ariosoma* Swainson, 1838, have formed one of the most puzzling and confused groups of the Apodes, a confusion resulting partly from inadequate descriptions by early authors and partly from the relative obscurity of generic characters. Parr's detailed but incomplete examination (1927, pp. 19–31) of these genera in his attempt to identify a single specimen, was the first step in the resolution of the many problems that had accumulated over the years. He concluded that until these genera were more critically examined and their limits more closely defined the only possible course at the time was to extend the genus *Ariosoma* to a broad sense to include all of these related genera. Since Parr's account, workers in the group have more clearly described their material and added to a more natural classification. The most recent of these was Wade (1946, pp. 181–185) whose key (modified from Reid, 1934, pp. 3–4) sets out the differences between a number of these genera. This key forms the general basis for the classification of the two species of *Pseudoxenomystax* described here; but while it is the most cohesive summary of the genera related to *Ariosoma* at present available, it is still incomplete.

The New Zealand congrids described in this paper are easily distinguished from members of the genus *Conger* Oken, 1817, in having the teeth not forming a cutting edge, an upper lip not strongly developed, an otic bulla present and a nasal bone

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present as a small, externally concave element with three finger-like, ventral extensions rather than as a flat, triangular plate. The New Zealand material is further distinguished in having the edge of the upper lip without a free, upturned labial flange; bony projections from the edge of the labial canal present; vomerine teeth in a band, not extending backward on the vomer in a single row; maxillary, premaxillary and vomerine teeth closely united in a single patch at the tip of the upper jaw. These characters immediately set off these New Zealand eels from all genera except *Rhynchocymba* Jordan and Hubbs, *Rhynchoconger* Jordan and Hubbs, *Pseudoxenomystax* Breder, *Gnathophis* Kaup, *Hildebrandia* Jordan and Evermann and *Bathycongrus* Ogilby. Mr. R. H. Kanazawa of the Division of Fishes, U.S. National Museum, informs me that *Rhynchocymba* is a synonym of *Gnathophis*. The latter genus, type species *G. habenata* (Richardson, 1848), from Cook Strait, New Zealand, has scroll-like ventrally-directed anterior nostrils and nasal bones consisting of three separate elements on each side, clearly in contrast to the short, simple, anteroventrally-directed tubes and the fused nasal elements of the eels considered here. The remaining genera are all closely similar and not well known but at the present time Kanazawa (personal communication) regards them as falling into three groups which are separated on the size and shape of the vomerine tooth-patch: *Hildebrandia,* having a short, squarish toothed area on the vomer; *Pseudoxenomystax,* in which the vomerine tooth-patch is long, and *Bathycongrus,* having a short triangular, toothed area on the vomer. *Rhynchoconger,* which, with *Pseudoxenomystax* was held to be a synonym of *Rhynchocymba* by Wade, can probably be referred to one of the above. *Bathycongrus,* a broad category when it was originally and briefly defined by Ogilby, must now be restricted. Its genotype is *Congermuraena nasica,* described by Alcock in 1894 as having the vomerine teeth in a single row along the anterior fourth of the bone. Kanazawa has examined a specimen of Alcock's species from the *Investigator* collection and informs me that the vomerine teeth in his specimen are grouped in a short triangular patch with only the most posterior two or three teeth uniserial, that is, somewhat differently than in the type. Even recognising variation in this feature in the genus *Bathycongrus,* on the character of the vomerine tooth-patch the New Zealand eels are therefore referred to Breder's *Pseudoxenomystax,* type species *P. dubius* Breder, 1927.

For similar reasons *Bassanago* Whitley is also referred to *Pseudoxenomystax.* Whitley describes the vomerine tooth-patch as long, equal to about half the length of the maxillary patch, exactly as in the New Zealand material. The swollen snout, which according to Whitley is so characteristic of the genus *Bassanago,* is insufficient for it to be considered a distinct genus, especially as this is also a feature of New Zealand specimens of a similar size. In most other characters the type species, *B. bulbiceps* Whitley, 1948, resembles the eels described below.

No mention has been made up to this point of the presence of the short, fleshy, villiform, epidermal processes over the surface of the body characteristic of adults of both of the New Zealand species, and also known to occur in the eels described under *Ariosoma* by Smith (1953, p. 393). These structures occur in various forms in *Coloconger, Promyllantor* and some species of *Bathycongrus* (personal communication from Kanazawa). So strikingly similar are the New Zealand eels to those described by Smith from South Africa that it is improbable that material from the two areas is to be referred to two different genera. Further information on the South African eels was supplied to the present author by Professor Smith. This shows that these eels can also be placed in *Pseudoxenomystax.* The upper lip is not developed strongly as an upturned flange; bony projections from the inferior edge of the labial canal are present; the vomerine teeth are distributed in an elongate band, narrowed posteriorly and not extending backward on the vomer in a single row; and the teeth are never pavement-like. Few of the premaxillary teeth are exposed when the mouth is closed, but the number is variable. Smith's

material, possessing such characters, cannot continue to be identified with *Ariosoma* and is here referred to *Pseudoxenomystax.*

Pseudoxenomystax hirsutus n. sp.

TYPE. V.U.W. Coll.; Dominion Museum No. 2829; 949 mm total length; ovigerous female; 430 fathoms, near Oaro, Kaikoura, New Zealand, November, 1958, by Mr. R. Baxter; commercial cray-fish trap.

PARATYPES. Four specimens: V.U.W. Coll; Dominion Museum No. 2830; 569 to 1028 mm total lengths; collected with the type specimen.

DESCRIPTION

Proportional measurements in thousandths of total length, type and paratypes (in brackets). Standard length 991 (986–991); head 147 (138–151); snout 37 (37–39); eye 25 (22–26); interorbital 24 (24–31); cleft of mouth 55 (52–58); postorbital 82 (84–88); branchial aperture 24 (18–24); branchial interspace 50 (39–52); pectoral 41 (39–46); snout-vent 406 (386–410); preanal 432 (409–432); predorsal 150 (142–151); depth at anal origin 79 (61–95); pectoral rays 15 (14–15); anal rays 213 (204–222); dorsal rays before level of vent 75 (65–82); dorsal rays 310 (306–314); caudal rays 8 (8); lateral line pores before level of vent 44 (39–44); lateral line pores 156 (151–170).

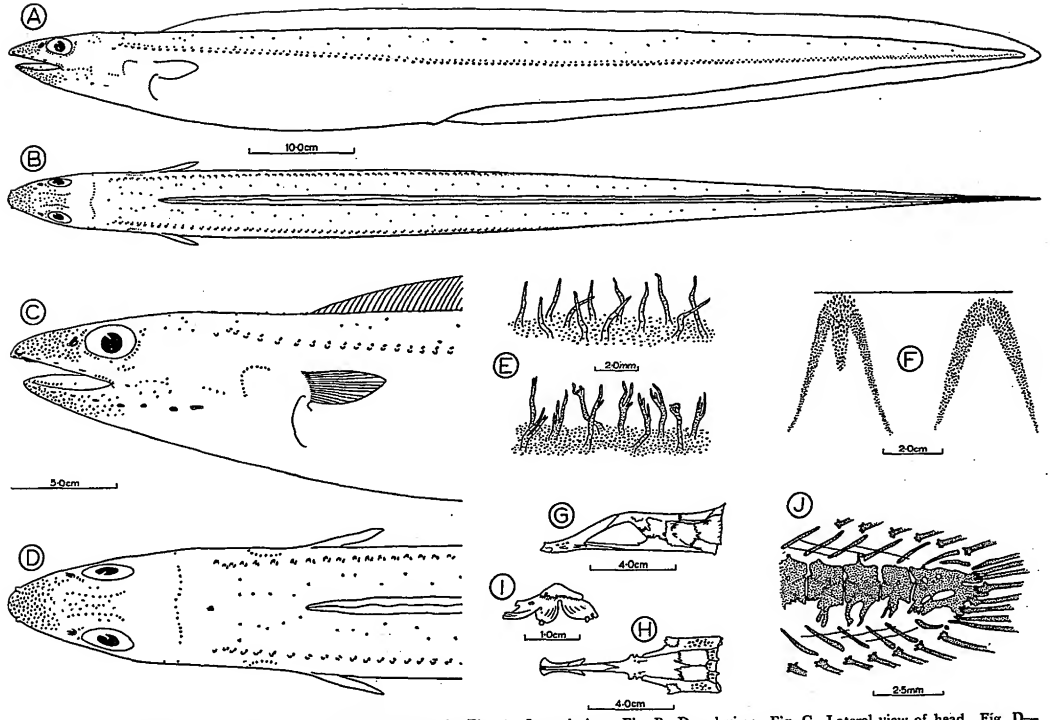
Body elongate, robust, compressed significantly only along caudal region; depth greatest at belly, especially in larger specimens, 1.6 in head, tapering evenly behind vent to tip of caudal region. Head prominent, with large eye, moderate gape, fleshy lower lip and well-marked sensory pores and papillae; fins well-developed with clearly-visible fin-rays; lateral line conspicuous, with the pores on the ends of short tubes; hair-like epidermal processes present over surface of body, usually villiform, but divided at their tips in larger specimens.

Head clearly differentiated from trunk, its length contained 1.8 times in trunk or 6.8 in total length; snout fleshy, relatively broader in larger specimens, 4.0 in head, projecting only moderately in advance of lower jaw, with a small longitudinal ridge on its ventral surface immediately anterior to premaxillary teeth; jaws strong, mouth subterminal; gape slightly oblique, falling close to the vertical from middle of pupil, or about 2.7 in head; upper lip scarcely developed, separated from the maxillary teeth by a minutely fimbriated, flat ridge; lower lip thick, fleshy, rounded, almost as in *Conger*, its inner surface fimbriated; tongue distinct.

Teeth present on maxilla, premaxillo-ethmovomer and dentary. Teeth on maxilla and dentary generally short, all of about the same size, acutely conical, very slightly recurved, closely-packed in irregular rows so as to form a cardiform band on each element. Maxillary band broad anteriorly with six rows of teeth, tapering gradually to two or three rows posteriorly. Premaxillo-ethmovomerine band with less closely-packed teeth and in two portions; anterior, premaxillary portion broadly (transversely) oval, adpressed between tips of maxillae and projecting in front of mandibles for a variable amount in different specimens, but usually for just over half its longitudinal diameter, bearing numerous sharp, retrorse teeth which are larger than those on either the upper or lower jaws; posterior, vomerine portion broad anteriorly and confluent with premaxillary portion, tapering posteriorly to a point level with anterior margin of posterior nostril, twice the length of premaxillary portion or just less than half the length of maxillary band; vomerine teeth broadly conical, more or less irregularly disposed but in about five to six longitudinal rows. Teeth on dentary forming a cardiform band nearly joining with the band of the other side across the symphysis, of about seven rows of teeth anteriorly, tapering sharply posteriorly, but otherwise similar in shape to the maxillary band, although a little shorter.

Anterior and posterior nostrils of the one side separated by a little more than diameter of eye; anterior nostril on anteroventral tip of snout as a short, thin-walled, anteroventrally-directed tube with a complete rim, the medial wall of the tube entirely free from snout; posterior nostril without an external tube, half diameter of pupil in advance of eye, on its horizontal diameter, sometimes with the opening compressed, usually with the opening wide, almost triangular in shape and the rim raised, but not fimbriated. Eye large, oval, with horizontal diameter 1.5 in snout or 3.5 in postorbital; interorbital space flat, relatively wider in larger specimens as a consequence of the broader snout, but about equal to diameter of eye in most specimens. Branchiostegals not obvious through skin but I have counted 10 on each side in two specimens macerated. Branchial aperture lateral, semi-circular, about equal to diameter of eye; dorsal extremity always below middle of pectoral base, often in line with its ventral margin; ventral extremity of aperture tending to be posterior to pectoral base so that aperture is oblique.

Median fins fleshy, with clearly-visible fin-rays, and continuous with the caudal. Dorsal originating variably, more often slightly behind level of pectoral origin, sometimes just in advance of pectoral origin, higher than anal, at vent contained five times in depth of body at that point, but higher near end of caudal region; dorsal fin-rays before level of vent about 75, total rays about 310; anal fin rather less strongly developed, with about 213 rays; caudal



TEXT FIG. 1.—*Pseudoxenomystax hirsutus* n.sp. Type, 949 mm t.l. Fig. A—Lateral view. Fig. B—Dorsal view. Fig. C—Lateral view of head. Fig. D—Dorsal view of head. Fig. E—Epidermal processes in the type (upper) and in a specimen of 1028 mm t.l. (lower) from above lateral line near level of vent. Fig. F—Upper (left) and lower (right) dentition, from impressions. Fig. G—Lateral view of neurocranium. Fig. H—Dorsal view of neurocranium. Fig. I—Lateral view of left preorbital bone. Fig. J—Lateral view of caudal skeleton.

indistinct, with eight rays. Pectoral fin elongate-oval, fleshy, contained exactly twice in postorbital, with 15 rays.

Lateral line marked by a low ridge originating at level of dorsal margin of eye halfway along postorbital, descending gradually to meet midlateral level just posterior to level of vent. Pores numbering about 156 of which the anterior 39–44 lie before level of vent, carried on the ends of short tubes which originate on the lower border of the lateral line ridge and are directed ventrolaterally. Cephalic pores distributed as follows: one large occipital pore lies in the mid-dorsal line at the level of the origin of the lateral line proper; two pairs of small, round pores lie between the anterior nostrils; one small pore behind the anterior nostril; two large, slit-like openings of the rostral canal immediately dorsal to, and between, anterior nostrils; three slit-like pores along the maxilla and one posterior to mouth; nine pores lying linearly along lower jaw and on to opercular region.

Minute, fleshy papillae, indicating the openings of mucous glands, present in rows on the head, a single row between the base of the dorsal fin and the lateral line and in the raised ridge of the lateral line itself. On the snout the papillae make up a pattern of rows in the interorbital space and beneath the eye. On the postorbital region a transverse row lies across the occiput; others lie behind the angle of the mouth and in a semicircular row just in advance of the pectoral. Between the dorsal fin and the lateral line lies a row of widely spaced papillae continuing along the full length of the body. Larger, more obvious papillae occur regularly in the lateral line, one papilla posterodorsal to each lateral line pore. Snout and anterior portion of lower jaw covered with numerous, minute, rounded knobs.

Body surface thickly and almost completely covered with minute, hair-like, fleshy epidermal processes, villiform and little pigmented in smaller specimens, divided at their tips, glove-like, and darkly pigmented in larger examples, so as to give the appearance of a dark, hairy coating to the body.

Colour in life blue-grey above, creamy-white below; dorsal fin dark-edged for a variable amount, anal fin rather less so; snout and nape tinged with violet; pectoral pink (blood-vessels); iris iridescent golden. In formalin the colour on the trunk and caudal region fades to brownish-pink.

Pseudoxenomystax bulbiceps (Whitley, 1948).

Bassanago bulbiceps Whitley, 1948. *Rec. Aust. Mus.* 22 (1): 71.
Ariosoma longicauda Moreland, 1957. In Knox, G. A., *Bull. N.Z. Dep. sci. industr. Res.*, 122: 34.

MATERIAL EXAMINED

Nine specimens: Chatham Islands, 1954 Expedition (D.S.I.R.) Station 40; 44° 32′ S. 176° 05′ E; S.E. of Pitt Id; 3/ii/54; 155 fathoms; fine green sand; otter trawl; 184–492 mm total lengths.

Two specimens: Chatham Islands, 1954 Expedition (D.S.I.R.) Station 41; 44° 35.5′ S. 176° 04′ E; S.E. of Pitt Id; 3/ii/54; 330 fathoms; fine green mud and sand; otter trawl; 291 mm and 335 mm total lengths.

One specimen: V.U.W.—Dominion Museum Collecting Trip (Bay of Plenty); Dominion Museum Station 209; 37° 20.5′ S. 176° 26.5′ E; off Mayor Id; 27/ii/57; 270 fathoms; otter trawl; 234 mm total length.

Two specimens: Coll. VUZ 90; Station HOR; 41° 40.5′ S. 174° 57′ E; south of Palliser Bay; 12/vii/57; c.600 fathoms; long-line and baited trap; 453 mm and 487 mm total lengths.

SPECIMENS OF *R. bulbiceps* PREVIOUSLY RECORDED

One specimen: F.I.S. *Endeavour*; 11/xii/1913; 200 fathoms; 258 mm total length, probably not mature; the type of *Bassanago bulbiceps;* collected from the eastern slopes of Bass Strait, Victoria, Australia; deposited in the Australian Museum, Sydney, as No. E.4633. The eleven specimens (above) from the Chatham Islands, 1954 Expedition were recorded as *Ariosoma longicauda* (Ramsay and Ogilby, 1898) by Moreland (1957, Append. 6).

DESCRIPTION

Proportional measurements in thousandths of total length. Standard length 982–987; head 133–163; snout 34–45; eye 26–29; interorbital 18–25; cleft of mouth 43–62; post-orbital 73–85; branchial aperture 16–21; branchial interspace 26–42; pectoral 34–49; preanal 362–423; predorsal 140–158; depth at anal origin 46–59; pectoral rays 16; anal rays 240–258; dorsal rays before level of vent 75–89; dorsal rays 327–353; caudal rays 8; lateral line pores before level of vent 43–48; lateral line pores 150–171.

Body elongate, slender, subcylindrical anteriorly, compressed posterior to vent; depth greatest at vent, contained about three times in head, not swollen at belly and with caudal region gradually tapering. Head in young specimens swollen before and behind eye so as to be clearly differentiated from trunk, with large eye, moderate gape, well-marked lower lip,

conspicuous sensory pores and minute papillae; fins moderately well-developed with delicate rays; lateral line conspicuous with the pores raised in small specimens, at the ends of short tubes in larger specimens; minute epidermal processes present over surface of body but hardly developed and difficult to see in specimens of less than 300 mm; myotomes well-marked along whole of trunk and tail.

Head clearly differentiated from trunk, especially in younger specimens in which it is swollen, and contained about 1.5 times in trunk or about 6.5 times in total length; snout fleshy, tumid, about 4.0 in head, projecting only moderately in advance of lower jaw; jaws strong, mouth subterminal; gape slightly oblique, barely reaching vertical from middle of pupil, or 3.0 in head; upper lip scarcely developed, its inner edge separated from maxillary dentition by a minutely fimbriated flat ridge; lower lip thick, fleshy, rounded, its inner edge fimbriated; tongue distinct.

Teeth present on maxilla, premaxillo-ethmovomer and dentary. Teeth on maxilla and dentary generally short, all of about the same size, acutely conical, very slightly recurved, closely-packed in irregular rows so as to form a cardiform band on each element. Maxillary band moderately broad anteriorly with about four rows of teeth, hardly tapering posteriorly. Premaxillo-ethmovomerine band with less close-packed teeth and in two portions; anterior, premaxillary portion broadly (transversely) oval, adpressed between, and clearly extending in advance of, the maxillary bands, so that when the upper and lower jaws are pressed together the premaxillary patch stands out almost completely in front of the mouth, bearing sharp, backwardly-directed teeth slightly larger than all others in the mouth; posterior, vomerine portion relatively narrow anteriorly, broadening posteriorly and finally narrowing to its extreme posterior tip which is level with a point halfway between the posterior nostril and the eye, nearly three times the length of premaxillary patch or not quite half the length of maxillary band; vomerine teeth generally in about three rows, a few minute and sharp anteriorly, but larger, more widely spaced and broadly conical posteriorly. Toothed area of dentary slightly shorter than maxillary band, not joining the toothed area of the opposite side across the symphysis of lower jaw, much broader anteriorly where the teeth lie in about seven rows, tapering posteriorly.

Anterior and posterior nostrils of the one side separated by a space equal to just less than diameter of eye; anterior nostril just above and in advance of premaxillary teeth as a short, thin-walled tube with a complete rim and directed anteroventrally; posterior nostril in advance of eye on its horizontal diameter, without an external tube but with a raised rim, not fimbriated, usually widely open and the opening triangular to oval in shape. Eye large, oval, with horizontal diameter 1.5 in snout or 3.0 in postorbital; fleshy interorbital usually less than diameter of eye but narrow in small specimens, relatively broader and flatter in larger examples. Branchiostegals obvious through skin in small specimens, numbering nine or ten on each side. Branchial aperture lateral, below pectoral, semicircular, just greater than half diameter of eye, in all specimens examined originating just anterodorsal to level of ventral extremity of pectoral base, conspicuously oblique so that the posterior (ventral) extremity is behind level of pectoral base; ventral extremities of branchial apertures usually separated by a distance equal to twice their length.

Median fins with fleshy bases but otherwise delicate, with fine fin-rays and continuous with the caudal. Dorsal origin not greatly variable, usually just behind level of pectoral base, slightly higher than anal, at vent contained three and a-half times in depth of body at that point, with rays numbering about 340 of which about 80 lie before level of vent; anal lower, with about 250 rays; eight rays in the caudal. Pectoral elongate-oval, fleshy, contained about twice in the postorbital, with 16 rays.

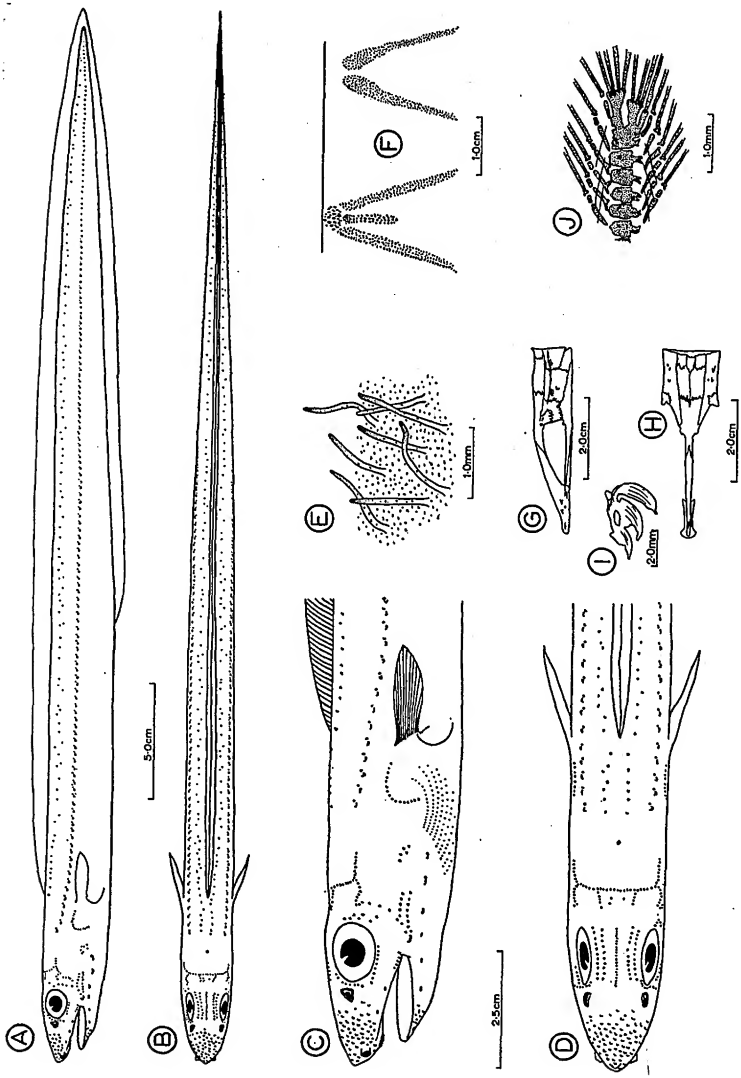
Lateral line marked by a raised ridge, originating near the level of dorsal margin of eye, nearer pectoral base than eye, descending gradually to meet midlateral level halfway along trunk. Pores numbering about 160 of which anterior 43–48 lie before level of vent, placed along ventral margin of the raised ridge of lateral line, in younger specimens barely raised, in older examples carried on the ends of short tubes. Cephalic pores as in *P. hirsutus*.

Minute, fleshy, papillae present in well-defined rows on head, between dorsal fin and lateral line and in lateral line itself, more numerous than in the previous species. Tips of snout and lower jaws covered with numerous, minute, rounded knobs.

Body surface thickly and almost completely covered with minute, hair-like, fleshy epidermal processes, not developed in specimens of less than about 200 mm, difficult to see in specimens of 200–300 mm but their presence indicated by a dull coating to the body. These processes, when developed, are villiform and undivided at their tips and bear pigment only at their distal extremities.

Colour in life greyish-brown over most of body, tinged with pink and with closely-packed minute brown spots along the dorsolateral surface; iris almost colourless; colour fading to greyish-pink in formalin.

Young of *P. bulbiceps* have fewer teeth on the vomer than older specimens, so that in an example of only 187 mm total length vomerine teeth number about 15–18 and the patch of teeth tends to be elongate triangular in shape; in a specimen of



TEXT-FIG. 2.—*Pseudoxenomystax bulbiceps* 453 mm t.l. Fig. A—Lateral view. Fig. B—Dorsal view. Fig. C—Lateral view of head. Fig. D—Dorsal view of head. Fig. E—Epidermal processes in a specimen of 453 mm t.l. from above lateral line near level of vent. Fig. F—upper (left) and lower (right) dentition, from impressions. Fig. G—Lateral view of neurocranium. Fig. H—Dorsal view of neurocranium. Fig. I—Lateral view of left preorbital bone. Fig. J—Lateral view of caudal skeleton.

about 450 mm there are about 30 vomerine teeth and the patch is more or less cigar-shaped. The teeth also increase in number with age along the jaws, and on the premaxilla. Young of *P. bulbiceps* tend to have a shorter trunk so that the head is more nearly equal to the trunk in specimens of about 200 mm but adults have the head contained about 1.6 times in the trunk.

Discussion

As an aid to the identification of the two species described in this account the type specimen of *Psepdoxenomystax bulbiceps* in the Australian National Museum, Sydney, has been kindly re-examined by Mr. G. P. Whitley for characters not included in the original description; specimens of *Ariosoma balearica,* a part of the material from which Smith made his description, were examined by Professor Smith in the Department of Ichthyology, Rhodes University, South Africa. These examinations supplemented the brief accounts of these two species in the literature.

Insignificant differences are revealed between the type of *Pseudoxenomystax bulbiceps* and New Zealand specimens of comparable length. The following are various body proportions in the type and in 14 New Zealand specimens (in brackets): head 6.8 (6.8–7.4), depth 19.8 (18.6–21.0) in total; eye 4.7 (4.7–5.2), snout 3.8 (3.0–4.1), cleft of mouth 3.4 (2.5–3.3), pectoral 3.4 (3.3–4.1), branchial aperture 6.3 (6.5–7.9) all in head; a–d percentage 23.6 (22.7–23.9). The type has 10 branchiostegal rays; the premaxillary patch of teeth is oval and about half the length of the vomerine patch which has four longitudinal rows; 47 pores lie before the level of the vent. New Zealand specimens have 9–10 branchiostegals; the premaxillary patch of teeth is oval and contained two and a-half to three times in the length of the vomerine patch which has three to four rows; 43–48 pores lie before the level of the vent. The swollen, bulbous, spongy head which is so characteristic of the type is also well-marked in small New Zealand specimens. In these specimens also the lateral line pores have raised rims and lie low down on the lateral line ridge, exactly as in the type; larger specimens have the pores on the ends of short tubes, apparently an adult character. Epidermal processes cannot be detected in the type but neither can they be found in New Zealand specimens of a similar length although these structures exist in adult New Zealand material. Considering the close likeness thus displayed between this material and the single specimen described by Whitley the present author has no hesitation in referring the smaller New Zealand species to *P. bulbiceps.*

The large eels described here as *Pseudoxenomystax hirsutus* bear a striking resemblance in general body proportions and in the presence of epidermal processes to *Ariosoma balearica* as described and figured by Smith from the South African region. South African specimens collected at the same time as that described by Smith have simple epidermal processes; there are 14 rays in the pectoral, 300 in the dorsal, and 240 in the anal; the lateral line pores number 43 before the level of the vent and are carried on the ends of short tubes. In the New Zealand material the dorsal always begins over the branchial aperture. This is in contrast to Smith's specimens in which the origin of the dorsal usually lies at a level halfway along the pectoral. On this basis the New Zealand eels are considered distinct from the South African *A. balearica* and are described as a new species.

Pseudoxenomystax bulbiceps and *P. hirsutus* themselves display a remarkably close external similarity. It was only when the difference in the fin-ray counts was discovered that the two species became separable. In the 14 specimens of *P. bulbiceps* examined there are 327–353 rays in the dorsal, 240–258 in the anal and 16 in the pectoral; this may be compared with 306–314, 204–226 and 14–15 in *P. hirsutus,* the larger species at maturity. Lateral line pores before the level of the vent are 43–48 in *P. bulbiceps,* 39–44 in *P. hirsutus,* the pectoral fin and trunk are more slender in *P. bulbiceps,* while *P. hirsutus* has a wide pectoral and is a deep-bodied bulky eel with correspondingly wider interbranchial and interorbital regions.

P. bulbiceps has the papillae of the head and snout more numerous and distributed in more regularly defined rows than has *P. hirsutus* (Text-fig. 1, figs. C–D and Text-fig. 2, figs. C–D). The uniserial papillae lateral to the base of the dorsal are also more numerous in *P. bulbiceps*. Teeth on the maxillae and mandibles are more or less similar in relative size and distribution in both species; the vomerine patch is narrower anteriorly and bears more numerous, smaller teeth in this region in *P. bulbiceps* than in *P. hirsutus* which has the vomerine patch broad anteriorly and more triangular. In both species the majority of the teeth on the vomer are broadly conical and relatively lower than all others in the mouth. *P. hirsutus* more usually has a greater number of longitudinal rows of teeth on the vomer.

The two species also show skeletal differences. The skull of *P. hirsutus* has the premaxillo-ethmoid (dorsal portion) convex, distinct postorbital processes of the frontals, the dorsal aspect of the cranial vault concave and a conspicuous complete flange surrounding the posterior border of the neurocranium. In *P. bulbiceps* the premaxillo-ethmoid is rather flat, there are only weak postorbital processes, the cranial vault may be convex dorsally and the posterior flange is weak and incomplete. The two specimens compared were both mature and it hardly seems likely that such differences are simply matters of age or size. The preorbital bone of *P. hirsutus* has a massive dorsal portion, relatively much larger than that of *P. bulbiceps*. The caudal skeleton of both species consists of three hypurals bearing a total of eight caudal rays; the hypurals are distally fused in *P. hirsutus* but completely separate in *P. bulbiceps*.

The two New Zealand species of *Pseudoxenomystax* differ from other Pacific species which have been referred to this genus in having the origin of the dorsal fin always over the level of the branchial aperture. *P. prorigerum* Gilbert, 1891, from the eastern Pacific has the head a little longer than the trunk, the origin of the dorsal an eye length in advance of the branchial aperture, 17 branchiostegals, 277 dorsal, 176 anal, 19 pectoral rays and 136 lateral line pores; *P. bleekeri* Fowler, 1933, has the dorsal originating slightly in front of the branchial aperture and the head a little longer than the trunk. In young of *P. bulbiceps* the trunk is relatively a little shorter than in older specimens but in neither does the head equal or exceed the trunk in length. No specimens of *P. hirsutus* examined have the head contained less than about 1.5 in trunk.

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